**CS2106 Introduction to Operating Systems**

**Lab 4**

**Contiguous Memory Allocation**

**Answer Book**

**Submission checklist:** A ZIP file called AxxxxxxY.zip, where AxxxxxxY is the student ID of the student submitting. The ZIP file should contain:

* Your answer book, properly renamed.
* Your malloc.c for ff, nf, bf, wf

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Question 3.1 (1 mark)

Our bitmap would be 8 bytes in size.

Question 3.2 (1 mark)

It would not make a difference if the array is of type unsigned char, as the characters are only used for bit operations and not arithmetic. In addition, the memory used by both types are the same, so even though char represents values from -128 to 127 and unsigned char represents values from 0 to 255, there are no differences in the context of this use case.

Question 3.3 (1 mark)

Our myfree routine needs to know how many bytes of memory need to be freed.

We initialised the TData struct, setting the len attribute of TData to the number of bytes that needed to be freed.

We then initialised the TNode struct with the key being the starting index of the memory allocation, and the pdata as the TData struct we initialised earlier.

When myfree is called, we obtain the starting index of the memory allocation using get\_index(), call find\_node(\_memlist, index), where the index is the one obtained from get\_index(), and obtain the len attribute from the pdata attribute of the obtained node.

We then call free\_map using the len attribute obtained earlier.

Question 4.1 (1 mark)

*int* isAllocated; // Boolean to check if memory is allocated  
*int* len; // Length of memory segment

Question 4.2 (1 mark)

size of TData: 8B

size of TNode: 48B

size of int: 4B

Best Case: In the best case scenario, there is only one empty TNode. Since the size of a TNode is 48 bytes, the storage requirement for the linked list in the best case is 48 bytes.

Worst Case: In the worst case scenario, the entire heap (64KB) is filled with TNode structures. Assuming each TNode takes 48 bytes, and there are 64 \* 1024 (64KB) nodes, the total storage requirement would be 64 \* 1024 \* 48 bytes, which equals 3,145,728 bytes.

Question 4.3 (1 mark)

Question 4.4 (1 mark)

Question 4.5 (1 mark)

Question 4.6 (2 mark)

**TOTAL: \_\_\_\_\_\_\_\_\_\_\_ / 10**